

3.6 the mighty chain rule
used to take the der. of a
composite function.

composite function : $y = f(g(x))$

function of a function

$$y = f \circ g(x)$$

$$y = f(g(x))$$

chain rule

$$y' = g'(x) \cdot f'(g(x))$$

der of inside

der of outside
{evaluate at
inside}

examples:

$$y = \tan(x^2 + 2x + 1)$$

$$y' = (2x + 2) \sec^2(x^2 + 2x + 1)$$

$$y = \sec^3 x = (\sec x)^3$$

$$y' = (\sec x \tan x) 3(\sec x)^2$$

der of inside

inside

outside u^3
der $\rightarrow 3u^2$

$$y = (\overset{\text{inside } u}{x^2 + 2x + 1})^7 \leftarrow \text{outside } u^7$$

der $7u^6$

$$y' = (2x + 2) \cdot (x^2 + 2x + 1)^6$$

$$y = x^3 \cdot (x^2 + 2x + 1)^7$$

$$y' = 3x^2(x^2 + 2x + 1)^7 + x^3((2x + 2) \cdot (x^2 + 2x + 1)^6)$$

pg 149 chain Rule

$$y = f(g(x)), \quad y' = g'(x) f'(g(x))$$

$$u = g(x)$$

$$y = f(u)$$

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$$

$$y = \sin(x^5)$$

$$\frac{dy}{dx} = \cos(x^5) \cdot 5x^4$$